Tripura Civil Engineering service

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TR/TES/C-II/DEG/16

Test Booklet Series

B

20.01.2017

TEST BOOKLET
CIVIL ENGINEERING PAPER-II
(DEGREE)

Signature of the Candidate

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Invigilator's Signature

Time allowed : 3 hours (Three hours) **Maximum Marks : 200**

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY TEST BOOKLET OF SAME SERIES.
2. **ENCODE CLEARLY THE TEST BOOKLET SERIES IN THE APPROPRIATE PLACE IN THE ANSWER SHEET BY BLACK BALL POINT PEN ONLY.**
3. This Test Booklet is divided into three sections, i.e **Section-A, Section-B & Section-C.**
   (A) **Section-A (MCQ pattern)** contains 40 items (questions). Each question, carrying 2 (two) marks only, has four responses (answers). You will select the response which you want to mark on the **OMR Sheet.** In case you feel that there is more than one correct response, mark the response which you consider the most appropriate. In any case, choose ONLY ONE response for each item. There shall be no negative marking for wrong/multiple answer.
   (B) Questions under **Section-B (Conventional Method) & Section-C (Conventional Method)** are to be answered in separate **answer book.**
4. You have to mark all your responses of **Section-A by Black Ball Point Pen only** on the separate OMR Answer Sheet provided. See directions in the Answer Sheet.
5. Before you proceed to answer the responses to various items in the Test Booklet, you have to fill in some particulars both in the Answer sheet for Section-A and in the Answer book for Section-B & Section-C.
6. On completion of the Examination, you should hand over the OMR Answer Sheet for Section-A & Answer Book for Section-B & C to the Invigilator only. You are permitted to take the Test Booklet with you.
7. Sheets for rough work are appended on the Test Booklet at the end.

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The figures in the margin indicate full marks for the questions.

Candidates are required to give their answer in their own words as far as practicable.

Scientific calculators are allowed. Assume data reasonably, if required.

All symbols have their usual meaning.

SECTION - A

Choose the correct answer from the four alternatives provided with each question and mark in the OMR answer sheet. 40×2=80

Example : As per Indian Roads Congress recommendation, the width of a lane of any carriage way is

(A) 7·5m

(B) 6·5m

(C) 5·5m

(D) 3·5m

1. An ideal flow of any fluid must fulfil the following

   (A) Newton's Law of Viscosity

   (B) Newton's Law of Motion

   (C) Boundary Layer Theory

   (D) Continuity Equation.

2. Pressure measured with the help of piezometer tube is

   (A) atmospheric pressure

   (B) gauge pressure

   (C) absolute pressure

   (D) vacuum pressure.

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3. As the depth of immersion of a vertical plane surface increase, the location of centre of pressure

   (A) comes closer to the centre of gravity of the area

   (B) moves apart from the centre of gravity of the area

   (C) ultimately coincides with the centre of gravity of the area

   (D) remains unaffected.

4. When water is flowing through pipe, the velocity of flow is

   (A) maximum at the centre and minimum near the walls

   (B) minimum at the centre and maximum near the walls

   (C) zero at the centre and maximum near the walls

   (D) maximum at the centre and zero near the walls.

5. In an open channel flow the discharge corresponding to critical depth is

(A) minimum

(B) maximum

(C) zero

(D) average.

6. Hydraulic turbines are the machines which convert water energy into

(A) mechanical energy

(B) electrical energy

(C) solar energy

(D) automatic energy.

7. Priming is not required in

(A) reciprocating pump

(B) centrifugal pump

(C) dynamic pressure pump

(D) hand pump.

8. Water turbines can be put in the decreasing order of specific speeds as

(A) Propeller, Reaction, Impulse

(B) Pelton, Francis, Kaplan

(C) Reaction, Impulse, Propellor

(D) None of the above.

9. Isohyets are

(A) Areas of equal precipitation

(B) Lines of equal precipitation on maps

(C) Lines of equal temperature on maps

(D) Lines of equal barometric pressure on maps.

10. Evapo-transpiration is

(A) water equivalent of moisture contained in air which is lost through evaporation

(B) uncounted loss of water by evaporation at a location

(C) evaporation from plants in a catchment area

(D) the total evaporation and transpiration from the catchment area.

11. A current meter measures, the velocity of flow, if it is held

(A) at the bottom surface of the channel

(B) at the surface of the channel

(C) at the centroid of the channel section

(D) at any point within the cross-section.

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12. Main cause of water logging is

(A) excessive seepage and percolation of water

(B) heavy rainfall

(C) occurrence of impermeable strata at shallow depth

(D) porosity of soil.

13. In arid areas with uneven land surface most suitable method of irrigation is

(A) basin method

(B) check flooding

(C) furrow irrigation

(D) sprinkler irrigation.

14. The BOD (Biochemical Oxygen Demand) of raw water indicates

(A) the extent of organic matter present

(B) the amount of treatment required for purifying

(C) both (a) and (b) above

(D) none of the above.

15. The dissolved oxygen level in natural unpolluted water at normal temperature is found of the order of

(A) 1 mg/lit

(B) 10 mg/lit

(C) 100 mg/lit

(D) 1000 mg/lit.

16. Which metal, if present in water causes poisoning ?

(A) Mercury

(B) Lead

(C) Arsenic

(D) All the above.

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17. Breakpoint chlorination of water involves addition of chlorine in an amount sufficient to

(A) react with any ammonia and readily oxidisable organic matter

(B) kill Giardia cysts

(C) react with inorganic matter

(D) reduce bacterial growth in filters.

18. For a well planned city, the suitable layout of distribution system is

(A) dead end system

(B) grid iron system

(C) ring system

(D) radial system.

19. A septic tank is

(A) an aerobic method of on-site sewage treatment

(B) an anaerobic method of on-site treatment

(C) a physical method of water treatment

(D) a physicochemical method of water treatment.

20. An activated sludge is

(A) the sludge that is obtained by settling of sewage in presence of abundant oxygen

(B) the sludge that has been subjected to 50% anaerobic action

(C) the sludge that is discharged from primary settling tanks

(D) the sludge that is obtained from the sludge digestion tank.

21. A device used to measure the flow of waste water is

(A) comparator

(B) weir

(C) sluice gate

(D) comminutor.

22. Main gas from land fills is

(A) oxygen

(B) nitrogen

(C) carbon monoxide

(D) methane

23. Which one of the following methods can be employed for plastic and rubber waste disposal

(A) composting

(B) incineration

(C) sanitary landfill

(D) pyralysis.

24. The relationship between void ratio 'e' and porosity ratio 'n' is

(A) $n = \frac{e}{(1-e)}$

(B) $e = n(1 + e)$

(C) $e = \frac{(1 + n)}{(1 - e)}$

(D) $n = \frac{(1 + e)}{(1 - e)}$

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25. Permeability of soil is affected by

(A) grain size

(B) void ratio of the soil

(C) structural arrangement of the soil particles

(D) all of the above.

26. The shear strength of a soil

(A) is proportional to the cohesion of the soil

(B) is proportional to the tangent of the angle of internal friction

(C) increases with the increase in normal stress of soil

(D) all of the above.

27. The seepage force in soils is proportional to

(A) exit gradient

(B) head of water at upstream

(C) head of water at downstream

(D) all of the above.

28. The slope of the linear portion of the pressure-void ratio curve on a semi-log plot is called
    (A) consolidation index
    (B) compression index
    (C) tension index
    (D) none of the above.

29. The dimensionless bearing capacity factors in Terzaghi's analysis correspond to
    (A) general shear failure
    (B) local shear failure
    (C) both of the above
    (D) none of the above.

30. A plate load test is useful to determine
    (A) bearing capacity of foundation
    (B) settlement of foundation
    (C) both bearing capacity and settlement of foundation
    (D) none of the above.

31. Pile foundations are normally used
    (A) in soft clayey soil
    (B) in heavy-loaded situations
    (C) when required bearing area is not available
    (D) in loose sandy soils.

32. The settlement of pile as compared to a spread footing is
    (A) less
    (B) more
    (C) unrelated
    (D) dependant on sub-soil condition.

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33. Chances of settlement is more in
    (A) cohesive soil
    (B) non-cohesive soil
    (C) both of the above
    (D) none of the above.

34. The survey in which the curvature of earth is ignored, is called as
    (A) plane survey
    (B) geodetic survey
    (C) geological survey
    (D) aerial survey.

35. Traversing is generally done by
    (A) chain
    (B) compass or theodolite
    (C) plane table
    (D) all the above are correct.

36. The first temporary adjustment of a prismatic compass is

(A) levelling

(B) focussing of the prism

(C) removing the parallax

(D) centering.

37. The levelling of instrument is done such that

(A) line of sight is truly horizontal

(B) optical axis is truly horizontal

(C) vertical axis is truly vertical

(D) line of collimation is truly horizontal.

38. In a bituminous pavement, alligator cracking is mainly due to

(A) inadequate wearing course

(B) inadequate thickness of sub-base course of pavement

(C) use of excessive bituminous materials

(D) fatigue arising from repeated stress application.

39. Bankelman beam deflection is used for design of

(A) rigid overlay on rigid pavement

(B) flexible overlay on flexible pavement

(C) flexible overlay on rigid pavement

(D) rigid overlay on flexible pavement.

40. California Bearing Ratio (CBR)

(A) is a measure of soil strength

(B) is a procedure for designing flexible pavements

(C) is a method of soil identification

(D) is a measure to indicate the relative strengths of paving materials.

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SECTION-B

Answer *all* the following 15 (fifteen) questions.

Restrict each answer within 40 (forty) words. $6 \times 15 = 90$

1. What do you understand by the term thickness of boundary layer ? Write down the equations for the thickness of boundary layer in laminar flow and turbulent flow.

2. What is hydraulic jump? Explain clearly how it is formed.

3. Discuss the various factors based on which the type of turbine is selected for a hydro-electric project.

4. Describe briefly different types of irrigation systems.

5. Mention different types of floods depending on their physical features involved. What are the methods generally followed for control and management of floods ?

6. What are the permissible limits/ standards of quality for domestic water in respect of its different important characteristics ?

7. Discuss different types of storage and distribution system of water supply. Also mention various types of layout of distribution system of water supply.

8. What is flow net ? Write down the fundamental properties/ characteristics of a flow net.

9. Define active earth pressure, passive earth pressure and earth pressure at rest.

10. What do you mean by foundation of a structure ? What are the various types of foundations ? Mention briefly the selection criteria of foundation.

11. What is compressibility ? Mention the assumptions based on which Terzaghi's One-Dimensional Consolidation Theory is established.

12. What is Contour ? Mention few important characteristics of contour. What are the uses of Contour maps ?

13. What is triangulation ? What is the purpose of triangulation ? Mention different types of triangulation.

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14. Why joints in concrete pavements are used ? Narrate different types of joints used in concrete pavements.

15. Mention different categories of road pavements generally used in highway construction. Write down the various methods of design of flexible pavements and describe briefly any one of the methods for determining the thickness of flexible pavements.

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SECTION - C

Answer *all* the following 5 (*five*) questions : 6×5=30

1. Water is supplied to a turbine through a pipe 3 kms. long. The water flows in the pipe with a velocity of 2 m/sec. A valve near the turbine end is closed in 30 seconds. Find the rise in pressure behind the valve in kg/cm^2.

2. A horizontal confined aquifer of 10m thickness and infinite aerial extent lies with its top level 25 m below ground level. Static piezometric surface is 10 m below ground level. During steady rate of pumpage from the well at 5000 m^3/day, the steady drawdown at the well is 12 m. Permeability of aquifer formation is 48 m/day. Assume the radius of influence as 500 m. Find the effective well diameter in meters.

3. A laboratory compaction test on soil having specific gravity equal to 2.68 gave a maximum dry density of 1.82 gm/cm^3 and a water content of 17 per cent. Determine the degree of saturation, air content and percentage air voids at the maximum dry density. What would be the theoretical maximum dry density corresponding to zero air voids at the optimum water content ?

4. In a 16 pile group, the pile diameter is 45 cm and centre to centre spacing of the square group is 1.5 m. If $c = 50\ KN/m^2$, determine whether the failure would occur with the pile acting individually, or as a group ? Neglect bearing at the tip of the pile. All the piles are 10m long. Take $m = 0.7$ for shear mobilisation around each pile.

5. The radius of a horizontal circular curve is 80m. The design speed is 45 kmph and the design co-efficient of lateral friction is 0.15.

   (i) Determine the superelevation required if full lateral friction is assumed to develop.

   (ii) Determine the co-efficient of friction needed if no superelevation is provided.

(Space for rough work)

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